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Causes and Adverse Effects from Overcrowding of Emergency Departments: The Solution

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Abstract

This paper will describe the purpose of emergency departments and how they have become overcrowded, overused, the problems associated with the overcrowding and the new strategies that have been put into place to lower the amount of emergency department visits. About half of reported emergency department visits are normally considered non-urgent and because of this, millions, if not billions of dollars are wasted. Overuse of emergency departments become overcrowded, and those in dire need of emergency care may have to be rerouted or have longer wait times if no beds are available.

Overuse of Emergency Departments not only effects the patients, it also effects the emergency department staff. The blame for this comes from the knowledge that most emergency departments will not deny a patient care in an emergency situation regardless of no insurance. Many of patients on Medicare or Medicaid are able to avoid the charges from an emergency department visit using this insurance especially if a patient has Medicare/Medicaid as a secondary insurance, because this can allow for those who have a copay for regular doctor visits to be avoided if they chose to go straight to an emergency department, urgent or minor.

More information about the causes and effects of overused emergency departments will be described in more depth throughout the paper. There will also be details of past conducted studies that have implemented a process that positively lowered the amounts of emergency department visits and wait times. This paper will discuss the purpose of emergency departments, why they have become overused and overcrowded, and give supported solutions for decreasing wait times, overcrowding, and over usage in emergency departments which in some countries, has been known as a national crisis.

Keywords: Emergency Department, Organizational Procedures, Overcrowding

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Causes and Adverse Effects from Overcrowding of Emergency Departments: The Solution

When someone is in immediate need of emergency care, surgical, cardiac, or medical care, it is expected that they be taken to the nearest hospital. Within the hospital, the patient in need of care will be seen in a department of the hospital for which its personnel are trained and, in most cases, fully equipped to respond to certain emergency situations. This department is called the Emergency Department, sometimes referred to as the ED, ER, or emergency room (Definition of Emergency Department). Staff within functioning emergency departments from managing to working with patients will be expected to be trained on how to recognize chaos within the emergency department in order to maintain a smooth flow of patients being admitted and discharged. They must also know how to control a chaotic environment, and if possible, know how to prevent it (Celenza, 2013). Without a smooth flowing process of admitting and discharging patients, things can get out of order causing a chaotic work environment. Following an implemented organizational structure within the emergency department decreases chances of adverse effects and/or overcrowding.

Emergency Department Workforce

The workforce within an emergency department consists of educated medical staff; emergency clinicians, emergency physicians, and emergency nurses. All of which complete medical procedures under extreme pressure when taking on risky procedures to save a life. Although working in an emergency department may be a tough, it can be very rewarding to know you saved a life. Emergency department overcrowding places the workforce in a chaotic

environment. Patients and family want answers but if there is overcrowding this make a patient wait for care much longer than it might need to be in the case of an emergency. There may be instances where a hospital is understaffed, causing more of a delay in patient care and an increase in patient length of stay. The good news is that all of the emergency departments' workforce should be well trained to handle any emergency situation, they are expected to care for patients, make them feel as comfortable as possible, give accurate diagnosis, and to avoid making any medical errors. Problem is, how can emergency clinical staff, physicians, and nurses make sure all is followed with emergency department overcrowding being a national crisis?

Causes of Overcrowding

According to the Center for Disease Control and Prevention, from 1992 to 2002 the yearly emergency department visits increased by 23% and the number of emergency departments decreased 15% (Stein, 2005). During this time period hospitals were closing, downsizing staff, and there was even a shortage in nurses nationwide. The decrease in emergency departments, increase in emergency department visits, nurse shortage, closures, and downsizing staff contributed to the overcrowding we see today, but these five contributing causes were just the beginning of what would come as a national crisis.

It would sound correct to say that an increase in emergency departments is largely due to those users who are uninsured, but surprisingly that information would be incorrect according to the Center for Studying Health System Change. The Center for Studying Health System Change

reported a substantial fraction of the emergency departments' visits that increased in 2001 to 2002 by 2.7 million was utilized by those that are insured users (Hwang, 2004).

In a report by the US General Accounting Office (GEO), one other contributing factor the overcrowding of emergency departments is the difficulty of admitting patients and moving them from admitted to inpatient beds. Most all hospitals are running at a much higher census, making it harder for emergency departments to admit a patient. This leaves emergency departments with a limited amount of inpatient beds, overcrowding, not enough staff to tend to all, then resulting in longer wait times and longer stays (Pediatrics, 2004). Emergency department overcrowding is also caused by the prolonged time of admitting patients but is most frequently caused by limitation of inpatient beds (Hosseininejad et al., 2014).

Information from the article, "Nonurgent patients in emergency departments: rational or irresponsible consumers? Perceptions of professionals and patients", published in 2012, was documented as a semi-structured interview study on patient misuse of emergency departments, how the phenomenon of nonurgency is perceived by health care professionals within emergency departments, and why patients choose emergency departments for nonurgent complaints. With their consent, the study used information given by 34 emergency department health professionals and 87 emergency department patients that a triage nurse categorized as nonurgent. Out of the 87 emergency department patients: 32.1% had tried to contact their primary care provider before coming to the emergency department, 4.6% were referred due to medico-legal reasons, 16.1% were referred by their primary care physician, 48.3% were there due to minor traumatic problems, 79.3% were self-referred, and 76% had symptoms for less than 24 hours that were related to their chief complaint. The study results for patients' reasons for emergency department visits were because of the advantages of the emergency department, barriers to primary care

providers, and for fulfilling their healthcare needs. Out of the 34 emergency department health professionals, some of the main topics that emerged from the interviews on why people choose the emergency department for non-life-threatening symptoms was the issue in the definition of an inappropriate visit and a nonurgent visit, the lack of primary care provider access on weekends and long wait times for office appointments, and patients not considering the cost of an emergency department visit at time of service due to being seen without paying up front. Most all of the emergency department health professionals described those who want immediate and indiscriminate health services are irresponsible patients. As for those who visit the emergency department with nonurgent symptoms, the emergency department health professionals described them as a consumer abusing healthcare (Durand et al., 2012).

Overcrowding should be recognized by the government and not solely on emergency department administrations as a public health crisis. In America, emergency department doctors (Less than 5% of doctors in America work in emergency departments) treat more uninsured and Medicaid beneficiaries with acute care than any of the American doctors together (Somma et al., 2014).

To examine non-emergent patients in wait times through triaging, a study was conducted at an emergency department in West Lincoln Memorial Hospital (WLMH). This hospital was located in a suburban community and servicing surrounding areas and the community of 24, 240. (Knapman & Bonner, 2010)

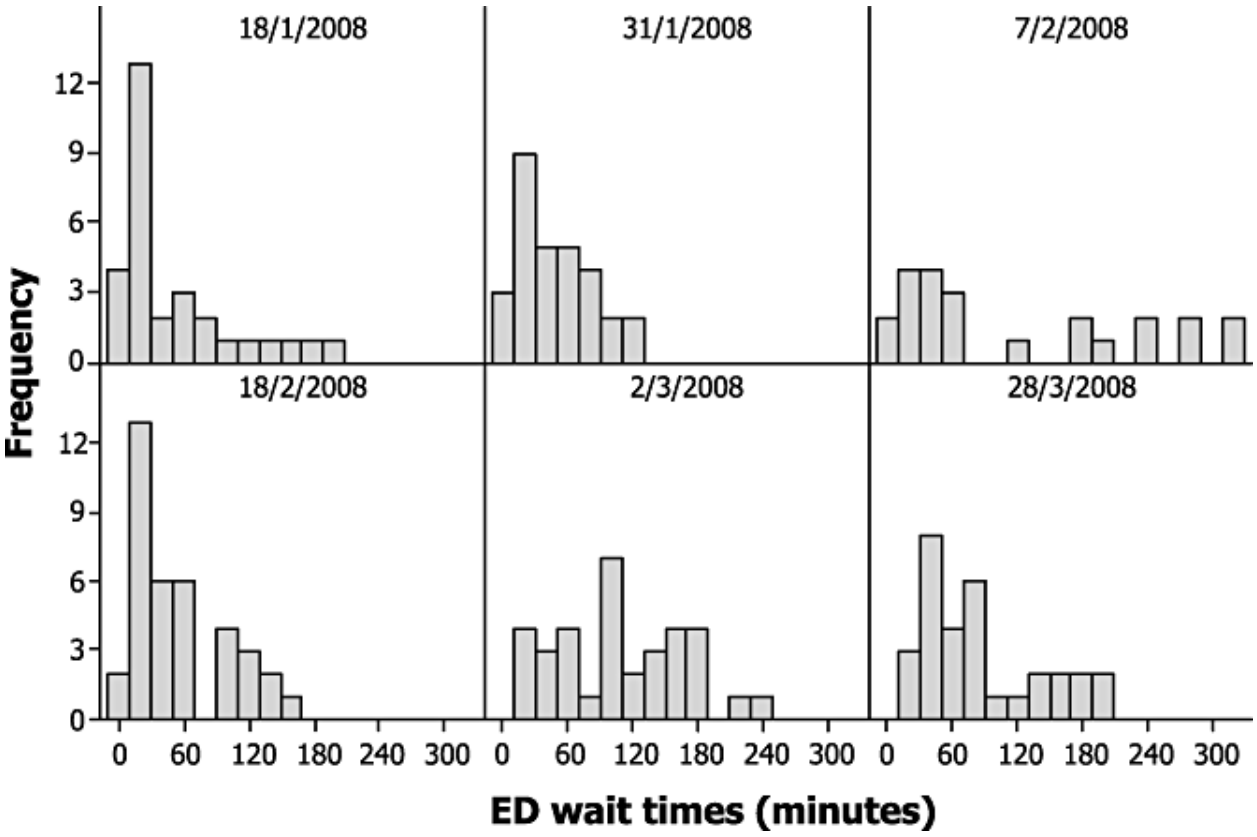
Table 2. Patient disposition Canadian Triage and Assessment Scale III, IV, V (Knapman, 2010 & Reay, 2016)

Patient flow	**Age group 1 (18–39)**	**Age group 2 (40–65)**	**Age group 3 (≥ 65)**
Input			
Non-ambulance arrival	81	83	37
Ambulance arrival	1	3	18
Throughput			
Average wait time (h) to physician assessment	1.06	2.03	0.96
Output			
Admit no bed	0	0	8
Admit in patient bed	0	4	9
Transfer	3	7	2
Home	70	64	18
LWBS	8	8	0

Patient flow	**Age group 1 (18–39)**	**Age group 2 (40–65)**	**Age group 3 (≥ 65)**
Total number of patients	82	86	55

Note: Adapted from Knapman, M., & Bonner, A. (2010). Overcrowding in medium-volume emergency departments: Effects of aged patients in emergency departments on wait times for non-emergent triage-level patients. *International Journal of Nursing Practice, 16*(3), 310-317. doi:10.1111/j.1440-172x.2010.01846.x & Reay, G., Rankin, J. A., & Then, K. L. (2016). Momentary fitting in a fluid environment: A grounded theory of triage nurse decision making. *International Emergency Nursing, 26*, 8-13. doi:10.1016/j.ienj.2015.09.006

LWBS, leave without being seen.



Frequency distributions of emergency department (ED) wait times.

Note: Adapted from Knapman, M., & Bonner, A. (2010). Overcrowding in medium-volume emergency departments: Effects of aged patients in emergency departments on wait times for non-emergent triage-level patients. *International Journal of Nursing Practice, 16*(3), 310-317. doi:10.1111/j.1440-172x.2010.01846.x

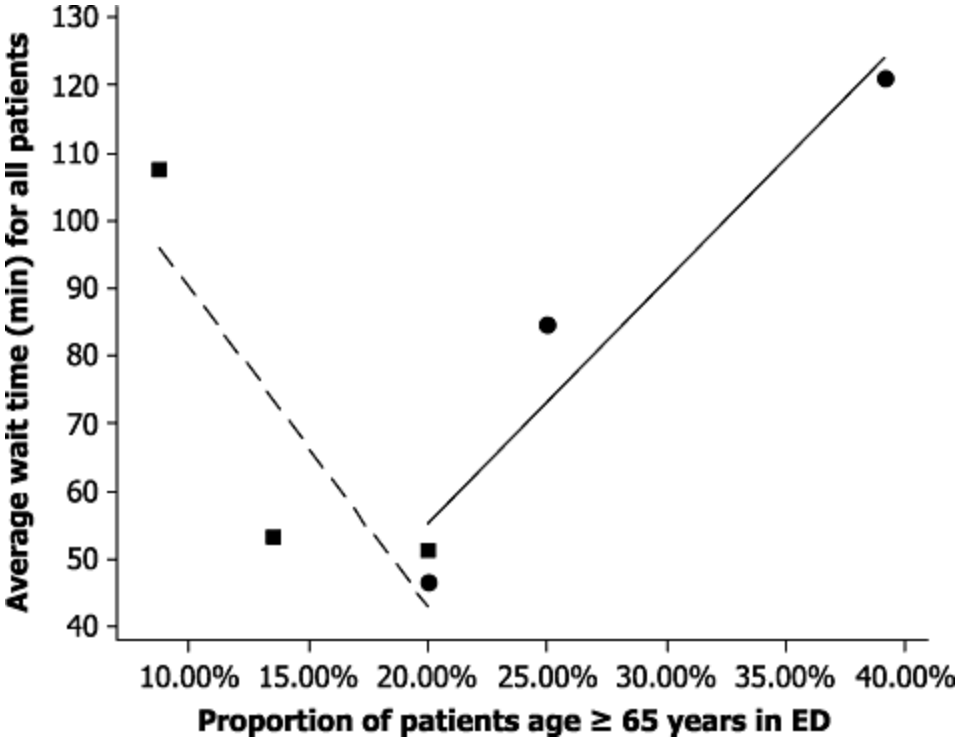


Figure 2

Relationships between crowding, average wait time for all patients and the proportion of patients aged ≥ 65 years in emergency departments (ED). Crowding: —●— 0; – –■– –: 1.

Note: Adapted from Knapman, M., & Bonner, A. (2010). Overcrowding in medium-volume emergency departments: Effects of aged patients in emergency departments on wait times for non-emergent triage-level patients. *International Journal of Nursing Practice, 16*(3), 310-317. doi:10.1111/j.1440-172x.2010.01846.x

Study results concluded that increased usage of emergency department by aged patients does affect internal and external factors. The affected factors are those that contribute to delays in care. The study shown that characteristics do in fact have an impact on nursing practices that force them triage nurses into adopting two different ways of practicing. Weakening the triage process for which is used for monitoring patient safety gives responsible nursing tasks, and nurse performance expectations (Knapman & Bonner, 2010).

A study that explored the reasons in why patients with non-urgent symptoms choose to go to the emergency department along with how this topic is perceived by the health professionals within the emergency department. Below is the table of questions that were used in the interviews of the emergency department patients and health professionals (Durand, 2012).

Table 1
Questions from interview guide (Durand, 2012)

Participants	**Primary questions**
ED patients	1. Would you describe to me what happened to you today?
	2. Why did you choose to come to the emergency department today?
	3. Do you have access to an alternative source of care to treat your current problem?
	4. What do you usually do when you are sick?
	5. Do you think that the emergency department is the most appropriate place to treat your current health care problem?
	Primary questions
ED health professionals	1. Would you describe the patients who present to the emergency department for nonurgent complaints?
	2. In your opinion, why do nonurgent patients choose to come to the emergency department rather than their family practitioner?
	3. What are the consequences of such nonurgent visits?
	4. Do you have any solutions to limit nonurgent ED visits?

Note: Adapted from Durand, A., Palazzolo, S., Tanti-Hardouin, N., Gerbeaux, P., Sambuc, R., & Gentile, S. (2012). Nonurgent patients in emergency departments: Rational or irresponsible consumers? Perceptions of professionals and patients. *BMC Research Notes, 5*(1), 525. doi:10.1186/1756-0500-5-525

At the time of 76% of patients' emergency department visits explained that their symptoms along with their presented chief complaint were present no more than 24 hours. 32.1% of the patients explained that they did try to reach out to their primary care provider before

presenting to the emergency department but it was an unsuccessful attempt. 79.3% of emergency department patients had been self-referred. 16.1% of the emergency department patients had been referred by either their primary care physician or because of medico-legal reasons by employer or police (4.6%). 48.3% which is about half of the emergency department patients had presented with minor traumatic issues. The table shown below describes patient reasoning in emergency department use (Durand, 2012).

Table 2
Reasons for ED use for nonurgent patients: category descriptions (Durand, 2012)

Theme and sub-category	Descriptors
Theme 1. Fulfill health care needs	
To alleviate pain or discomfort	▪ "It's urgent because it hurts"
	▪ "I suffered for a while there. I've been trying to tough it out, but I suffer too much."
Anxiety generated by the complaint	▪ "I don't consider my problem serious, but I am worried because I am hurting."
	▪ "I do not know what I have, but it worried me, so I preferred to come immediately to the ED so at least I am reassured."
	▪ "I was afraid; I was concerned because I did not know if my problem was serious."
Theme 2. Barriers to primary care providers	
Difficulty obtaining an appointment with their PCP in a timely manner	▪ "When I called my doctor, he said that he was booked up, and he instructed me to go to the ED."
	▪ "It is impossible to see him during the week if you are sick (speaking of her PCP). It is too long."
	▪ "I called my doctor but he could not see me, so I preferred to come to the ED because the pain was unbearable."

Theme and sub-category	Descriptors
ED is the only alternative to accommodate work schedules	▪ "When I am sick and miss a day of work, I need to see a doctor that day. I can't afford to be off work any longer. I need to feel better and go back to work the next day"
	▪ "After 6 p.m., nothing else is open."
Discerning health consumers	▪ "I preferred the ED to my doctor because it is so hard to get in to see him."
	▪ "I knew that my doctor could not see me. So, I came to the ED."
	▪ "My doctor consults by appointment only. He doesn't have time for me."
Theme 3. Advantages of the ED	
Availability of diagnostic tests and treatment	▪ "My doctor cannot do X-rays or laboratory tests, while the ED has all the technical support."
	▪ "I'd rather be here than run around. At least here x-rays can be done."
Convenience	▪ "Everything is in one place."
	▪ "The doctors perform things a lot faster."

Note: Adapted from Durand, A., Palazzolo, S., Tanti-Hardouin, N., Gerbeaux, P., Sambuc, R., & Gentile, S. (2012). Nonurgent patients in emergency departments: Rational or irresponsible consumers? Perceptions of professionals and patients. *BMC Research Notes, 5*(1), 525. doi:10.1186/1756-0500-5-525

During the interview with emergency health care professionals and their perception on non-urgent emergency department patients there were four themes that stood out. Those four themes were; 1. For patients to know the difference between an inappropriate visit and a non-urgent care visit, 2. To know the reasons for non-urgent complaints to be presented at the emergency department, 3. To know a solution to counter the problem at hand, and 4. To know what the consequences are for non-urgent complaints (Durand, 2012).

Table 3
Perceptions of ED health professionals regarding nonurgent ED patients

Theme and sub-category	Descriptors
Theme 1. Problem of defining a nonurgent visit and an inappropriate visit	
No specific definition	▪ "It's easy to consider a nonurgent case at the end of the consultation, but it's very difficult in the triage area."
Perception of what constitutes a nonurgent case	▪ "Anything that is not life-threatening."
	▪ "A condition is nonurgent if it can be treated in 2 to 3 days."
	▪ "Consultations are nonurgent if the chief complaint is a non-serious illness that can be treated by a PCP."
Difference between nonurgent cases and inappropriate cases	▪ "If no other sources of care are available, patients have no other choice but to go to the ED. In this case, a nonurgent consultation could be considered appropriate."
	▪ "All patients whose care can be given at a facility other than the ED."
	▪ "We must redefine what is an emergency, what is an appropriate visit to the
	ED, and what is inappropriate, but it is very difficult to define."
Theme 2. Reasons for using EDs for nonurgent complaints	
Lack of access to PCPs	▪ "PCPs are not available evenings and weekends…"
	▪ "Continuity of care in primary care services is not guaranteed on Saturdays and Sundays."
	▪ "In some geographical sectors, there is virtually no primary health care structure ensuring continuity of care.

Theme and sub-category	Descriptors
	EDs are the only medical places available 24 hours a day, seven days a week."
Health care consumerism	▪ "The use of care is similar to that of products, i.e. fast and easy… We are in the Internet age, where everything is readily available, and the use of health care is no exception to this trend."
	▪ "The population evolves towards the need for rapid response to a need."
	▪ "People want to receive care on the same day, including access to technical facilities."
	▪ "Frustration is not acceptable".
No advance payment at the time of the ED visit	▪ "Some patients come to EDs for financial reasons. There is a perception that the hospital is free, but it is not."
	▪ "People believe that the medical consultation is free at the time of the ED visit, but the consultation is supported by our health insurance system."
Theme 3. Consequences of the increase in nonurgent ED visits	
	▪ "It is a problem when there are peaks of activity…This increase in utilization of EDs has induced overcrowding, prolonged wait times, delayed diagnosis and treatments, reduced quality of care, and increased the risk of adverse outcomes."
	▪ "Most ED colleagues are stressed because EDs are not structured for primary care."
	▪ "They (ED colleagues) feel that they no longer practice emergency medicine."
Theme 4. Solutions to reduce the number of ED visits for nonurgent complaints	

Theme and sub-category	Descriptors
Patient education	▪ "We should communicate more about what is a real urgent problem."
	▪ "Perhaps if people were educated regarding the importance of primary care and the appropriate use of EDs, they might seek ED care less often."
To reorganize the health care system by improving the continuity of care outside regular business hours	▪ "We could have primary care consultations in close proximity to the ED. These consultations would be opened between 8 a.m. and midnight. When there is a real emergency, patients would be sent back to the ED."
	▪ "A working collaboration between EDs and PCPs would improve accessibility to ensure that services are used effectively and efficiently."
To integrate a "gatekeeper" at the ED	"To determine patients having authorization for care in ED, a physician should discern whether the consultation is appropriate or not."
A financial penalty for patients categorized as nonurgent after the consultation	▪ "If it's not urgent, we look after you, but you will pay - you will pay at least an "emergency fee";
	▪ "No significant financial penalties to prevent the use of EDs exist."

Note: Adapted from Durand, A., Palazzolo, S., Tanti-Hardouin, N., Gerbeaux, P., Sambuc, R., & Gentile, S. (2012). Nonurgent patients in emergency departments: Rational or irresponsible consumers? Perceptions of professionals and patients. *BMC Research Notes, 5*(1), 525. doi:10.1186/1756-0500-5-525

Adverse Effects from Overcrowding

Large and inappropriate use of anything is a contributing factor of inefficiency and waste. This also applies to inappropriately use of emergency departments. In fact, emergency department visits have been estimated at costing $38 billion dollars each year. The 24hr availability and fully equipped emergency departments are an attraction to many patients seeking urgent and non-urgent treatment. For decades, even up to today, most emergency department visits have been identified as abusive and unwarranted (Adams, 2013).

Overcrowding in emergency departments poses a threat to patient safety within the facility. The threat this poses to patient safety ranges from longer than average wait time for those who are critically ill to medical errors. Overcrowding can delay the availability of inpatient beds including inpatient acute or critical care beds. Medical errors can easily happen in a chaotic work environment with an overcrowded waiting room with patients in urgent need of care (Trzeciak & Rivers, 2003).

For example, a survey completed by Coughlan and Corry in 2007, they examined some previous emergency department patients' experiences they endured while under a hospitals care. The conclusion was that overall, patients were unsatisfied with their emergency department visits. One of experiences mentioned by one of the surveys participants was that the patient had to wait five days in the emergency department before he/she was admitted into a ward due to overcrowding. Theoretically, if in the case of treating a patient with pneumonia, needing antibiotics, undergoing treatment is to be done within four hours from the time the patient arrived. In another case, relating to new left-bundle branch block or ST-elevation myocardial infarction for percutaneous intervention should be handled within 90 minutes from the time of the patient's arrival. Both applied standards are based on the Joint Commission Organization (JCO) 2010. Gathered information from the Coughlan and Cory (2007) survey, overcrowding

can omit or delay these interventions, adversely affect treatment for future patients, and can also negatively impact a hospitals performance, reputation, and income (Collis, 2010).

Overcrowding threatens access to those needing emergency services the most. In the United States, between the time period of 1992-2001, the figure below shows the number of emergency visits in the United States per 100 persons (Pediatrics, 2004).

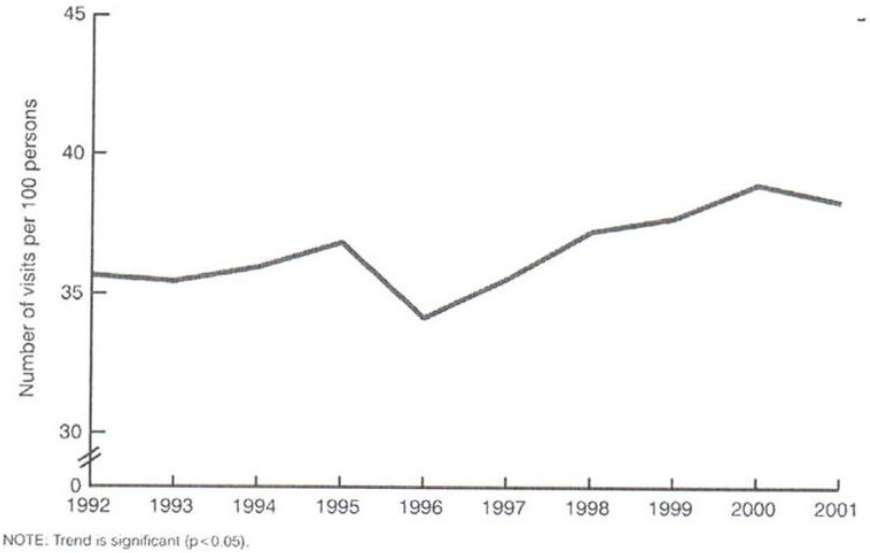


Fig. 1. Trend in ED visit rates: United States, 1992–2001. Source: McCaig LF, Burt CW. *National Hospital Ambulatory Medical Care Survey: 2001 Emergency Department Summary*. Hyattsville, MD: National Center for Health Statistics; 2003.

Note: Adapted from Overcrowding Crisis in Our Nations Emergency Departments: Is Our Safety Net Unraveling? (2004). *Pediatrics, 114*(3), 878-888. doi:10.1542/peds.2004-1287

In 2002 there were approximately 43.6 million Americans who were uninsured. This includes children through 21 years and younger of 12.5 million. America's nonelderly population in 2002 had a decrease in health insurance coverage lower than the past percentage of 82.7% that was recorded in 1987. American homeless persons have been estimated to consist of somewhere between 4 – 13 million without health coverage. However, in America there are 30% or more children 21 years or younger, equaling 24.2 million children 21 years or younger who are insured

under government funding health insurance, Medicaid. Medicaid has improved the life of impoverished children significantly, though the program has failed the creation of equity between the children who live above the poverty line and Medicaid beneficiaries (Pediatrics, 2004).

Overcrowding within emergency departments in some cases has resulted in increased mortality and morbidity, longer length of stay, adverse events, inferior health care, and poor patient outcomes. Based on information by the Joint Commission on (Morris, 2018) the Accreditation of Healthcare Organizations (Morris, 2018), one third of (Morris, 2018) the 50% medical errors that occur in emergency departments are caused by overcrowding based on information by the Joint Commission on (Morris, 2018) the Accreditation of Healthcare Organizations (Morris, 2018) (Somma et al., 2014).

In this article, “Adverse effects of overcrowding on patient experience and care,” by John Collis, Collis undertakes a systematic review of overcrowding effects to help discover what improvements can be done to better change patient experiences. Below are the list of factors and

results of emergency department overcrowding (Collis, 2010).

Overcrowding factors	Result
Number of patients in the emergency department (ED) as a proportion of available beds.	When EDs are at more than 120 per cent capacity, pain assessments may not be documented.
Census, number of patients waiting in hallways, or 'boarders', and boarding burden.	As the number of boarders increases, oligoanalgesia becomes more likely.
Bed-occupancy rate and numbers of waiting patients, boarders and total patient-care hours.	Overcrowding increases the time to analgesia.
Total patient-care hours.	No significant correlation between overcrowding and delay in the time to analgesia was found.
Bed-occupancy rate and numbers of waiting patients and hours spent on patient care.	Overcrowding delays in the provision of analgesia.
Length of stay.	Long ED stays are associated with decreased use of guidelines and higher mortality rates
Bed-occupancy rate, average length of stay, and numbers of waiting patients, boarders and patient-care hours.	Overcrowding is associated with poor treatment outcomes in patients admitted with chest pain.
Ambulance diversions.	Overcrowding is associated with delays in transport of patients with chest pain.
Ambulance diversions.	Overcrowding is associated with delays in thrombolysis in patients with acute myocardial infarction.
Number of patients in the ED.	Overcrowding is associated with delays in the administration of antibiotics.
Length of stay.	Overcrowding is associated with delays in administration of antibiotics for pneumonia but not in percutaneous intervention for acute myocardial infarction.
Total patient-care hours.	Overcrowding is associated with delays in administration of antibiotics.
Number of boarders.	Overcrowding increases the frequency of undesirable events.
Hospital occupancy and blocking of access.	Overcrowding is associated with a 30 per cent increase in mortality.
Length of stay of more than 12 hours.	As lengths of stay rise, patients become dissatisfied.
Waiting-room, treatment and boarding times, and clinical inpatient occupancy rate.	Overcrowding is associated with timeliness of care in the ED.
Bed-occupancy rate, waiting-room time, total patient care hours, ED census, waiting-room census and boarders.	Overcrowding is associated with a perception that emergency care has been compromised.
Waiting, boarding and ED treatment times, and hallway placement.	Overcrowding is associated with patient dissatisfaction.

* from 128 patients, NA = not applicable

Note: Adapted from Collis, J. (2010). Adverse effects of overcrowding on patient experience and care. *Emergency Nurse, 18*(8), 34-39. doi:10.7748/en2010.12.18.8.34.c8152

How can we know for sure if how crowded is overcrowded within an emergency department? The answer has been discovered from an article (Hwang, 2008), "Care in the Emergency Department: How Crowded is Overcrowded?" by Ula Hwang, MD (Hwang, 2008), and John Concato, MD, MS, MPH (Hwang, 2008) in 2004. (Hwang, 2004)

TABLE 1. Explicit Definitions of ED Overcrowding

1. ED factors
   - Real-time computerized tracking of waiting times, treatment times, and current census of actual patients in the ED being treated or waiting to be seen[5]
   - Number of visits >120/d (840/wk)[16]
   - Lack of capacity in observation area[17]
   - *Response of nurses' and physicians' opinions of ED overcrowding and telling of being rushed[18]
   - ED bed ratio, acuity ratio, provider ratio, demand value[19]
   - *Patients wait >30 min, or all ED beds filled >6 h/d, or patients placed in ED hallway, or physicians rushed[20]
   - *Patients wait >30 min, patients wait >60 min, ED beds filled >6 h/d, patients placed in hallways >6 h/d, waiting room filled >6 h/d, physicians feel rushed >6 h/d[21]
   - *Patients wait >60 min to see physician, ED beds full >6 h/d, patients placed in ED hallways >6 h/d, emergency physicians feel rushed >6 h/d, waiting room filled >6 h/d[22]
2. Hospital factors
   - When there are no available in-hospital beds for patients admitted from the ED[23]
   - †ED crowding occurs when ED patients are ready but unable to be admitted to either a floor or an ICU bed and are held in the ED[24]
   - Reduction of inpatient beds and a critical shortage of health care professionals[25]
   - †When admitted ED patients cannot leave the department because all staffed inpatient and ICU hospital beds are occupied and no beds are available in neighboring facilities for transfer[26]
   - From boarding inpatients already admitted to the hospital for hours to several days[27]
   - When patients needing admission cannot leave the ED because of unavailability of inpatient beds[28]
   - †When admitted ED patients cannot leave the department because all staffed inpatient and ICU beds in the hospital are occupied and no beds are available in neighboring facilities for transfer[29]
   - When acute care beds become filled[30]
   - When the delay in transfer of admitted patient to a hospital bed is longer than 4 h[31]
   - (Admitted) patients held overnight in the ED[32]
   - Too many sick patients, and too many admitted patients[33]
3. External factors
   - Periods of ambulance diversion[34]
4. Combination of factors
   - Patients wait >90 min, ED beds filled >6 h/d, >30% ED beds filled with admitted patients, patients in hallway >6 h/d, full waiting room >6 h/d[35]
   - Registered ED patients who Leave Without Being Seen (LWBS), and frequency and duration of EMS diversion[36]
   - Staff shortages, lack of available beds, poor operational process, increased number of patients who seek care, lack of universal access, shortage of inpatient beds, and hospital closures[37]

*A group of authors publishing similar criteria.
†A (different) group of authors publishing similar criteria.

Note: Adapted by Hwang, U., & Concato, J. (2004). Care in the Emergency Department: How Crowded Is Overcrowded? *Academic Emergency Medicine, 11*(10), 1097-1101. doi:10.1111/j.1553-2712.2004.tb00686.x

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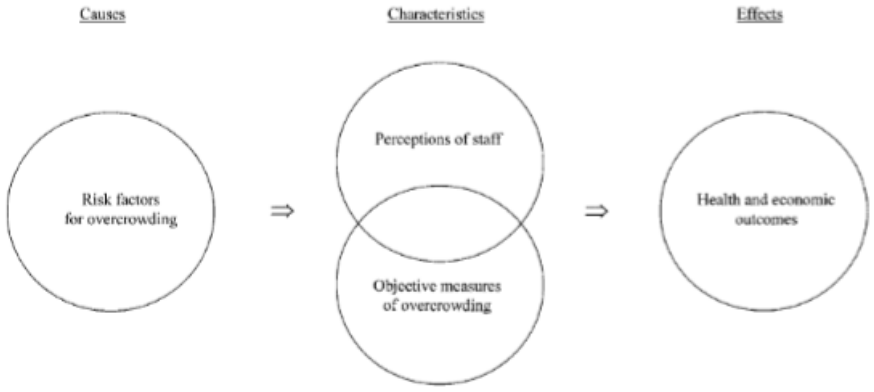

Figure 1. Conceptual model showing how a particular study is pertinent to emergency department overcrowding.

Note: Adapted by Hwang, U., & Concato, J. (2004). Care in the Emergency Department: How Crowded Is Overcrowded? *Academic Emergency Medicine, 11*(10), 1097-1101. doi:10.1111/j.1553-2712.2004.tb00686.x

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In a multidisciplinary atrial fibrillation treatment study within the emergency department it was discovered that this approach would make an improvement. This study went on for a period of 12 months collecting data. Below is a vision of what the treatment pathway consists of in a summarized figure adapted from the study article (Ptaszek, 2016).

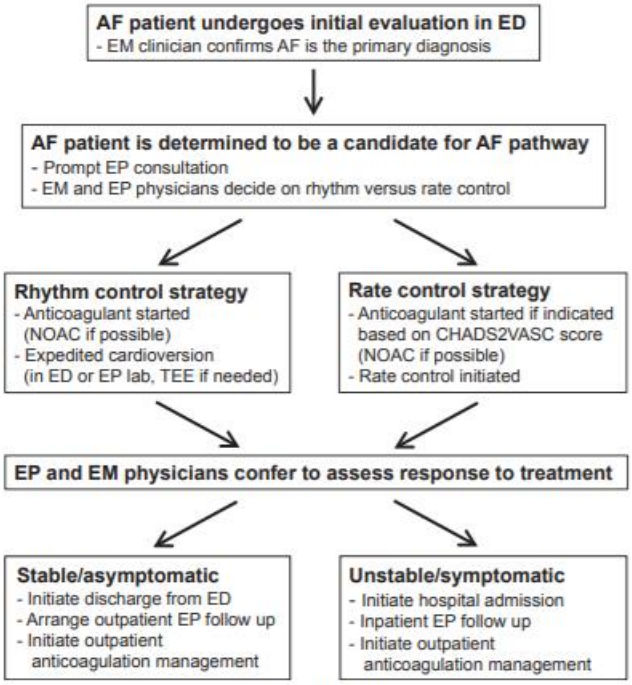

Figure 1. Flow diagram of the multidisciplinary AF pathway protocol. Patients who qualified for treatment according to the AF pathway were identified as soon as possible after initial presentation to the ED. Identification of appropriate candidates was followed by prompt consultation of the EP physician. After evaluation of the patient by the EP team, the EP and EM physicians determined whether a rhythm or a rate control strategy should be pursued. For those patients in whom a rhythm control strategy was chosen, the EP team expedited cardioversion. For all AF pathway patients, the EP team assisted in the choice of oral anticoagulant. Clinicians from the EM and EP services then evaluated the patient's response to therapy. A joint decision was then made regarding whether the patient was a candidate for discharge from the ED.

Note: Adapted from Ptaszek, L. M., White, B., Lubitz, S. A., Carnicelli, A. P., Heist, E. K., Ellinor, P. T., . . . Mansour, M. (2016). Effect of a Multidisciplinary Approach for the Management of Patients With Atrial Fibrillation in the Emergency Department on Hospital Admission Rate and Length of Stay. *The American Journal of Cardiology, 118*(1), 64-71. doi:10.1016/j.amjcard.2016.04.014

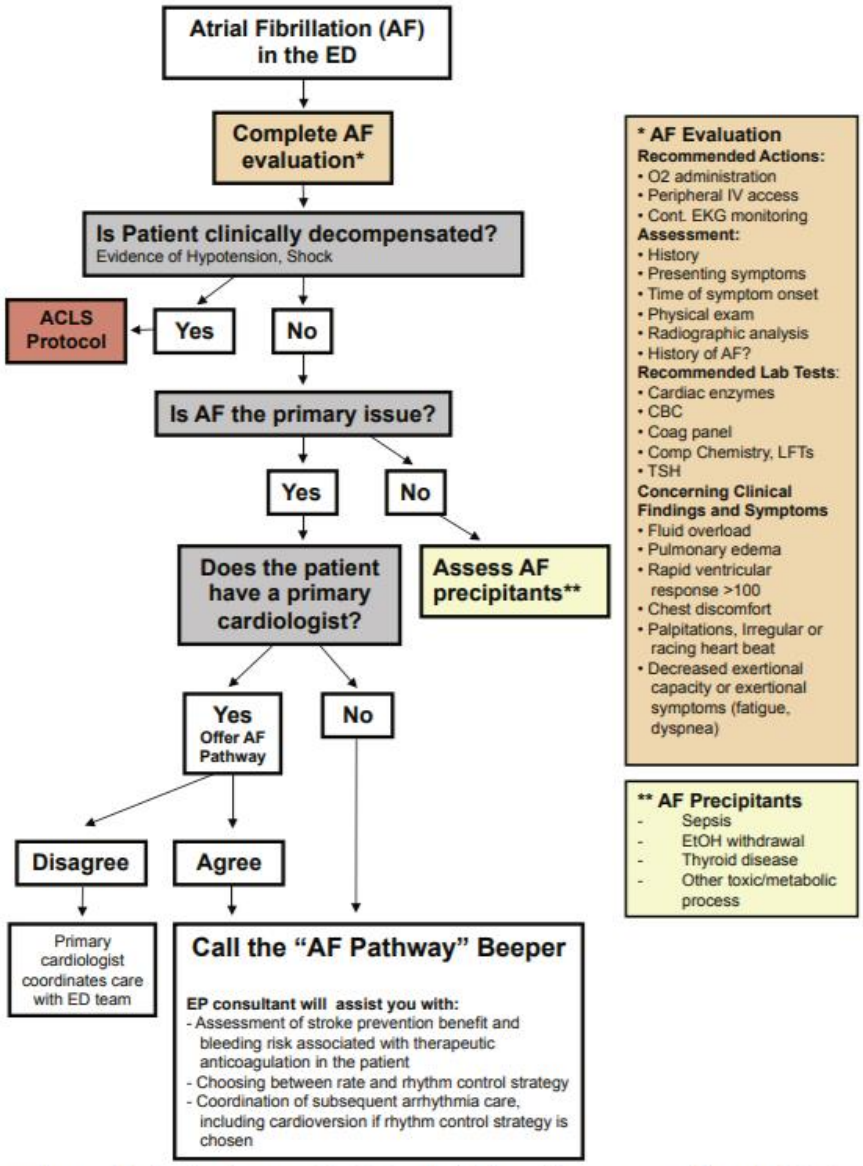

Figure 2. An AF pathway document that describes the process of evaluating a patient for possible treatment according to the AF pathway. All clinical support documents relevant to the AF pathway were placed in an electronic repository that was available to EP and EM clinicians throughout the study period.

Note: Adapted from Ptaszek, L. M., White, B., Lubitz, S. A., Carnicelli, A. P., Heist, E. K., Ellinor, P. T., . . . Mansour, M. (2016). Effect of a Multidisciplinary Approach for the Management of Patients With Atrial Fibrillation in the Emergency Department on Hospital Admission Rate and Length of Stay. *The American Journal of Cardiology, 118*(1), 64-71. doi:10.1016/j.amjcard.2016.04.014

The number of presented patients to the emergency department with atrial fibrillation as their primary diagnosis were of 359. Then out of the 359 patients mentioned with primary diagnosis as atrial fibrillation, 94 of them had been treated as according to the pathway for atrial fibrillation and were used in the pathway cohort for atrial fibrillation. Below is a flow diagram of the cohort selection analysis and the outcome analysis adapted by the study article (Ptaszek, 2016).

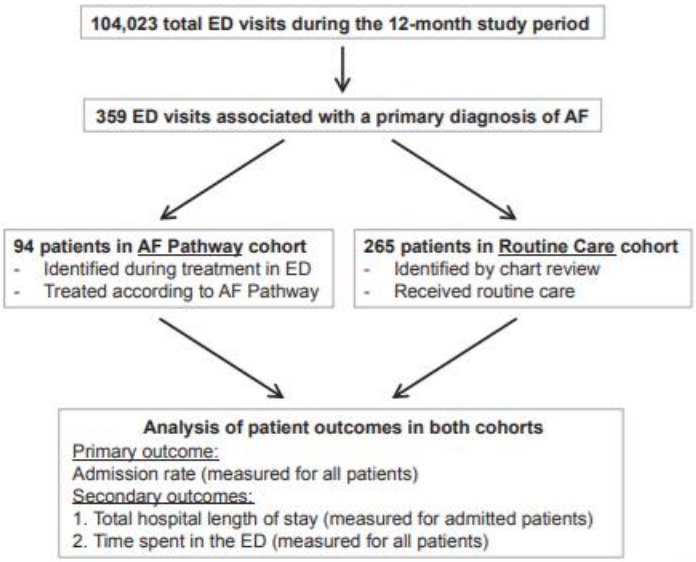

Figure 3. Flow diagram of cohort selection and outcomes analysis. In this prospective, observational study, patients included in the AF pathway protocol were identified at the time of ED presentation. Patients who qualified for treatment according to the AF pathway but instead received routine care were identified by chart review. The same set of outcomes analyses were performed for both cohorts.

Note: Adapted from Ptaszek, L. M., White, B., Lubitz, S. A., Carnicelli, A. P., Heist, E. K., Ellinor, P. T., . . . Mansour, M. (2016). Effect of a Multidisciplinary Approach for the Management of Patients With Atrial Fibrillation in the Emergency Department on Hospital Admission Rate and Length of Stay. *The American Journal of Cardiology, 118*(1), 64-71. doi:10.1016/j.amjcard.2016.04.014

In the table above is of the study cohorts selected that is also adapted by the study article reviewed. Emergency department physicians had the decision up to their discrepancy as to treat patients according to the atrial fibrillation pathway or to treat with normal routine care. Though all results concluded to a positive outcome with following the atrial fibrillation pathway, a detailed explanation would better prove how well this pathway worked (Ptaszek, 2016).

Patient symptoms reported to the emergency department at initial presentation in both cohorts with either atrial fibrillation, pre-match, and post-match are as follows.

Atrial Fibrillation as Presenting Symptom

Lightheadedness 33%, Palpitations 77%, Asymptomatic 5%, Chest discomfort 20%, and Dyspnea/Fatigue 42%.

Post-Match

Lightheadedness 18%, Palpitations 46%, Asymptomatic 10%, Chest discomfort 24%, and Dyspnea/Fatigue 34%.

Pre-Match

Lightheadedness 17%, Palpitations 36%, Asymptomatic 10%, Chest discomfort 17%, and Dyspnea/Fatigue 24%.

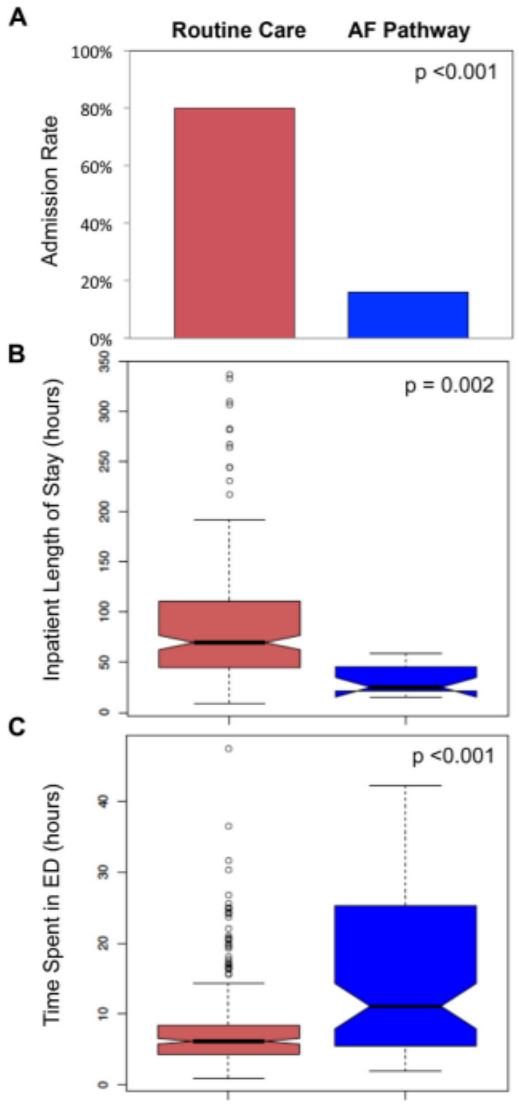

Figure 4. Effect of AF pathway utilization on the primary and secondary study outcomes. For all panels, data for the routine care group are depicted in *red* and data for the AF pathway are depicted in *blue*. *(A)* Bar graph describing rates of hospitalization for the routine care group and the AF pathway group. The observed difference is statistically significant ($p < 0.001$). *(B)* Box plot describing hospital length of stay for patients who were admitted after receiving treatment for AF in the ED. Data for the AF pathway and routine care cohorts are displayed. For each cohort, the *dark line* represents the median length of stay. The *box limits* represent the first and third quartiles. *Whiskers* represent the most extreme data point that is not more than 1.5 times the length of the box away from the box border. *Circles* represent outliers. Mean hospital length of stay was significantly shorter for the AF pathway cohort ($p = 0.002$). *(C)* Box plot describing the time spent in the ED for all patients, irrespective of hospital admission status, for both study cohorts. Data are presented in the same manner as in *(B)*. Mean duration of the ED stay was significantly longer for the AF pathway cohort ($p < 0.001$).

Note: Adapted from Ptaszek, L. M., White, B., Lubitz, S. A., Carnicelli, A. P., Heist, E. K., Ellinor, P. T., . . . Mansour, M. (2016). Effect of a Multidisciplinary Approach for the Management of Patients With Atrial Fibrillation in the Emergency Department on Hospital

Admission Rate and Length of Stay. *The American Journal of Cardiology, 118*(1), 64-71. doi:10.1016/j.amjcard.2016.04.014

The use of the atrial fibrillation pathway within emergency departments was linked to reduction, a 5-fold reduction in admission rate when compared to the normal routine care. Although, those who were treated for atrial fibrillation routinely 80% were cared for and for those who were treated for atrial fibrillation using the pathway 76% were only treated. Those who were also treated with the atrial fibrillation pathway had an earlier discharge than of those who were treated routinely. Given the percentage of how many were treated for atrial fibrillation using two different methods, the one with the lowest percentage of cared for patients over came on the outcome of improvement, which is the atrial fibrillation pathway (Ptaszek, 2016).

Advertising a hospitals emergency department wait times on billboards, social media, radio ads, etc. This is absolutely a marketing strategy by far, but more less an even bigger issue. Advertising emergency department wait times is a very powerful marketing strategy and indeed has some adverse effects. This type of advertising steers patients to their emergency department versus another because no patient wants to wait to receive care for a problem they feel is urgent. Shorter wait times sounds great, but don't be fooled. Some of the advertised hospitals with short wait times are not a fully equipped hospital or they do not specialize in certain areas meaning you would have wasted time going to the advertised emergency department in the first place. Like in the article "Advertising Emergency Department Wait Times," by Scott G. Weiner, MD, MPH, he gives three cases of why advertising emergency department shorter wait times is a threat to society, below are a few similar cases as to what Weiner had discussed (Weiner, 2013).

Case #1 A man in his 60's leaves work early without telling any coworkers his symptoms other than not feeling well. He was leaving early to go to the nearest hospital because he was experiencing chest discomfort. On his way to the nearest hospital he noticed a hospital adverting their wait time of a maximum of 60 minutes. When he sees this, he decides to head to that emergency department which happened to be an extra 10 miles away from the hospital he initially had planned on visiting. During his drive there the 60-year-old man develops a ventricular fibrillation arrest that then caused him to run off the road crashing his vehicle and dies.

Case #2 A man in his 50's has been diagnosed with hypertension. He was prescribed medication and took the medication as directed on the label but failed to schedule a follow-up visit with his primary care physician. This resulted in his medication running out and no way to refill it unless he makes another appointment with his primary care physician but knows he will not be able to do that because of the symptoms he is currently feeling seem urgent. He decides to go to the emergency department that he remembered seeing an advertisement for that read short wait times. Once at the emergency department the emergency physician was able to write the man a 10-day prescription. The physician also advised the man to follow-up with his primary care physician to get a prescription for a month's supply and keep the visits regular so that you don't have to run into this problem again. The problem that occurred here were the patient's insurance did not cover the emergency department visit costs, but his insurance covers his regular primary care visits.

Case #3 A woman who is of the age of 25 spots an advertisement from hospital about their short wait times of 30 minutes. For two weeks she has had rhinorrhea and sore throat so she decided to go on to the advertised hospital to get treatment. Upon arrival to the emergency

department she notices that there had been a pile up on a nearby highway involving traumatic injuries to multiple people who were being rushed into the same emergency department. Her wait time resulted in a 2 hour wait time due to the emergency staff having to devote their time to the trauma patients piling in. After evaluation the emergency department staff diagnosed her with a viral upper respiratory infection and recommended she get some over the counter medication to treat the infection. This woman left unsatisfied and frustrated by the misleading advertisement of only a 30-minute wait period. She was left feeling like her visit to the emergency department was a total waste.

Given the above three examples of emergency department wait time advertising that steered patients to their hospitals, it leaves us questioning if healthcare advertising does more harm than good? Even though healthcare advertising for encourage patients to visit the facility advertising it can also be an encouragement for patients in a dangerous way to self-triage themselves. Some advertisements that may have lured a patient in could have easily been an advertisement that had been published years or months ago that may not have any relevance to the healthcare facilities capabilities at the current date (Weiner, 2013).

Solutions

The common solution to decrease emergency department visits that are considered non-urgent comes easy. Starting with the insurance, deny payment of non-urgent emergency visits. In reality, this brilliant idea had actually been considered by some insurance companies until the idea was proven to be almost impossible to use based on the research by Raven and colleagues

that was published in a JAMA issue. Raven and colleagues research was based on health insurance companies, including Medicaid and Medicare, denial of non-urgent emergency department visits and how well it would or would not work. This research shown how difficult it would be for an insurance to deny such emergency visits for which the difficulty lies in the initial patient complaints that were presented to the emergency department, because most patients diagnosed with non-urgent symptoms presented to the emergency department are similar to the symptoms of those whose visits were considered urgent. The difference between whether or not one patient's visit is to be denied based on consideration of non-urgent emergency or urgent emergency is hard to determine if the initial complaints were at first considered to be an urgent matter (Adams, 2013).

Triage systems and triage teams have been proven to decrease wait time in emergency rooms based on the given information gathered from a study conducted to present certain strategies that have been proven to be effective in the reduction or delay emergency department overcrowding. The study was performed by using a computerized database search in identifying similar articles including those from Science Direct, Scopus, Wiley online library, ISI Web of Science, PubMed, Google Scholar, and other international, governmental, and national websites and databases. The table below replicates the table presented in the study's article that shows the provided details and the specific search combinations and terms used with help from the MeSH service in the website databases of PubMed (Yarmohammadian, Rezael, Haghshenas, & Tavakoli, 2017).

Database	Other Keywords	Results

ISD	Waiting time measurement, the length of stay	7
PubMed	Nonurgent visits redirection, triage processes, fast track, transfer of care, patient handoff, emergency department enlargement, utilization of emergency departments	334
ISI Web of Science	Patient grouping, emergency department under crowding, patient flow, admission predictive tool, emergency care delivery, prioritization, waiting times	22
Scopus	Offload zone patient selection, capacity allocation in emergency departments, patient transfer, streamlined admission, emergency department referral, routes of admission, overcrowding management, emergency department rooms assigning	427
Google Scholar	Same as all of the other keywords	68
Wiley online library	Busy emergency departments, safe capacity in emergency departments, delayed disposition, emergency journey, emergency	5

	department occupancy, short-stay units in emergency departments, patient disposition, access block, clogging emergency department	
Science direct	**Complaints and violence in the emergency department, capacity in emergency departments, overcrowding strategies, emergency medicine, overcrowding mitigation**	**143**

Note: Table created based off of Table 1 from Rezaei, F., Yarmohammadian, M., Haghshenas, A., & Tavakoli, N. (2017). Overcrowding in emergency departments: A review of strategies to decrease future challenges. *Journal of Research in Medical Sciences* (Yarmohammadian, Rezael, Haghshenas, & Tavakoli, 2017)*, 22*(1), 23. doi:10.4103/1735-1995.200277

The main strategies in emergency departments that shown to be controlling the overcrowding are as follows in Table 2 listed below from the article, “Overcrowding in emergenct departments: A review of strategies to decrease future challenges,” by F. Rezaei, M. Yarmohammadian, A. Haghshenas, N. Tayakoli (2017).

Strategies	Patient characteristics	Responsible practitioners	Coverage	Advantages	Challenges
Streaming	For minor injuries, especially those patients discharged home[22]	ED clinicians	All patients	Reducing crowding Improve the efficiency Groups of patients co-located to discrete areas to provide care with resources according to patients' needs[23]	Streaming creates the potential for one stream to be under pressure with treatment delays while another is quiet[24] Misallocation of patients[25]
Fast track	Nonemergency patients with uncomplicated diseases[26,27]	Nurse practitioner and doctors[28]	10% and 30% of total patients are seen in the ED[29,30]	Reducing the total number of patients staying in the ED Improving patient satisfaction and patient safety Patients received high quality of care[28,31]	Usually more applicable during peak hours, i.e., not during nights[32]
Team triage	Most significant in complex situations	A team with administration of a senior physician/ nurse, a nurse initially evaluates the patient (spot check) and a receptionist or a nurse assistant[24,33,34]/ physician-MDRNSTAT*[35,36]/ TLPs* role[37]	Not found	Increasing accuracy and efficiency in the initial process of patient evaluation[35] as all of the team members received the same information simultaneously, thereby allowing them to work in a more coordinated manner[38] Patient examinations and diagnostic measures would be initiated earlier[39] Reduce LOS* for low-acuity patients[40] Improving teamwork within hospitals[34]	Handling time per patient is essential to define the tasks of a team indirectly Team triage is not implementable if sick patients are waiting at the expense of minor injuries and for 24 h because of the insufficient resources[24]
POCT/ POC-US*	For high-risk patients suspected to have HIV or other dangerous communicable disease/ dyspnea patients whose laboratory, radiology and ultrasound tests were ordered by the ED[41-43]	POCT-trained nurses	About 30%–66% of all patients at an ED[8,44]	Improvement of nurses' ability to incorporate testing into their existing clinical care[45] Positive effects on LOS or waiting times[46,47]	Increased costs POCT effect only on patients discharged home, and no significant impact on patients admitted to hospital The limited impact can be expected if many patients need central laboratory analyses in addition to POC[48]
Ideal ED patient journey models (within EDs)[51]	Acute care of complex, nonambulatory, high-acuity patients Lower acuity, complex, nonambulatory patients Noncomplex, ambulatory patients	Early senior medical assessment Clinical initiatives nurse Clerical officer co-located with the triage nurse	Not found	Providing multiple MOC* options to assess and treat patients Allowing local health facilities have access to appropriate MOC depending on their ED Ensuring tasks are performed by the provider who can most efficiently perform the task Eliminating duplication of processes Reducing unproductive waiting periods	A direct referral to another provider for those patients who need care, but do not require emergency care Mental health Dental Sexual assault without injuries requiring ED management Early pregnancy assessment service Palliative care Aged care assessment and rehabilitation Specialist referral (rooms or direct to inpatient ward) Hospital in the home and postacute care services Outpatient's clinic referral Urgent care center Medical assessment unit Surgical assessment unit Postoperative review patients Drug and alcohol patients Fracture reviews

*MDRNSTAT = Physician–nurse supplementary team at triage; MOC = Models of emergency care; TLPs = Triage liaison physicians' role; POC-US = Point-of-care-ultrasonography; LOS = Length of stay; POCT = Point-of-care testing; EDs = Emergency departments

Note: Adapted from Rezaei, F., Yarmohammadian, M., Haghshenas, A., & Tavakoli, N. (2017). Overcrowding in emergency departments: A review of strategies to decrease future challenges. *Journal of Research in Medical Sciences* (Yarmohammadian, Rezael, Haghshenas, & Tavakoli, 2017)*, 22*(1), 23. doi:10.4103/1735-1995.200277

Based on results from a systematic literature review study on Triage Nurse Ordering (TNO) effectiveness on reducing length of stay using seven biomedical electronic databases: ABI/INFORM, HealthSTAR, MEDLINE, EBM Reviews – Cochrane Central Register of Controlled Trials, EMBASE, Dessertation Abstracts, and Science Citation Index Expanded; implementation of Triage Nurse Ordering (TNO) had proven to be an effective intervention in decreasing emergency department length of stay. The main outcomes from the Triage Nurse Ordering intervention effectiveness on length of stay randomized clinical trial: a significant reduction in emergency department length of stay for patients who were injured with a suspected fracture, a significant reduction in emergency department length of stay for x-ray ordering when compared to emergency nurse practitioner x-ray ordering and emergency physician x-ray ordering; however, there were not any significant improvements with length of stay for patients who did not have a suspicion of fracture or injury. Triage nurse ordering intervention evidence has proven to be effective to emergency department length of stay and can be easily implemented into emergency departments with a small amount of additional staff training (Rowe et al., 2011).

Table 1
Descriptive Characteristics of Studies Included in the Review

First Author (Year)	Location	Sample	Intervention Period	Study Design	TNP Intervention	Comparison
Bliss (1971)[25]	United States	100	Unknown	Retrospective cohort study	Triage nurse initiated distal limb x-rays only.	ED physician initiated x-ray
Stiell (1993)[26]	Canada	1,180	5 months	B-A	Triage nurse initiated foot/ankle x-rays only.	ED physician initiated x-ray
Lee (1996)[17]	Hong Kong	1,633	3 months	Prospective cohort study	Triage nurse initiated x-rays.	ED physician initiated x-ray
Thurston (1996)[16]	United Kingdom	1,833	NR	RCT	Triage nurse initiated x-rays.	ED physician initiated x-ray
Parris (1997)[15]	Australia	175	3.25 months	CCT	Triage nurse initiated x-rays.	ED physician initiated x-ray
Ching (1999)[24]	Singapore	276	3 months	C-C	Triage nurse initiated limb/skull x-rays using a standardized form.	ED physician initiated x-ray
Lindley-Jones (2000)[14]	United Kingdom	675	2 weeks	RCT	Triage nurse initiated x-rays.	ED physician/ENP initiated x-ray
Winn (2001)[27]	United States	40	2 months	Retrospective cohort study	Triage nurse initiated diagnostic test (e.g., x-ray, blood test, urinalysis, ECG).	ED physician initiated diagnostic test
Cheung (2002)[18]	Canada	250	NR	B-A	Triage nurse initiated x-ray and blood test.	ED physician initiated x-ray and blood test
	Australia	1,806	12 months	Prospective cohort study	Triage nurse initiated isolated distal upper or lower limb x-rays only.	ED physician initiated x-ray
Fan (2006)[19]	Canada	130	3 months	RCT	Triage nurse initiated x-rays.	ED physician initiated x-ray
Pedersen (2009)[23]	Denmark	106	NR	Prospective cohort study	Triage nurse initiated x-rays on low-energy injuries.	ED physician initiated x-ray
Rosmulder (2010)[22]	Netherlands	704	22 days	B-A	Triage nurse initiated foot/ankle x-rays only.	ED physician initiated x-ray
Retezar (2011)[21]	United States	15,188	2 years	Retrospective nested C-C study	Triage nurse requested investigations for chest pain, shortness of breath, abdominal pain, or genitourinary complaints.	ED physician initiated investigations.
Totals (n = 14)	Three Canada; Three United States	100–15,188	2 weeks–2 years	Variable	Triage nurse.	ED physician

B-A = before–after study; CCT = controlled clinical trial; C-C = case-controlled study; ECG = electrocardiography; ENP = emergency nurse practitioner; NR = not reported; RCT = randomized controlled trial; TNP = triage nurse protocol.

Note: Adapted from Rowe, B. H., Villa-Roel, C., Guo, X., Bullard, M. J., Ospina, M., Vandermeer, B., . . . Holroyd, B. R. (2011). The Role of Triage Nurse Ordering on Mitigating Overcrowding in Emergency Departments: A Systematic Review. *Academic Emergency Medicine, 18*(12), 1349-1357. doi:10.1111/j.1553-2712.2011.01081.x

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Using a redesigned nurse driven triage team in improving efficiency and to decrease patients' length of stay, using Six Sigma Lean methodology, a team of bedside nurses recreated a

new workflow process for triage. This team took place at a hospital emergency department in California. The team of nurses examined other surrounding California hospitals triage teams and their staffing ratio. They also reviewed other surrounding hospitals policies, regulations, data for their estimated length of stay, and procedures. This team of nurses were able to identify condition specific order sets to be implemented within their hospital for their triage patients. The phase 1 implementation took place and it was until 9 weeks later that there had been a change in the triage patient length of stay. The change was an improvement, a decrease in length of stay from 3.3 hours to a whopping 2.14 hours. That's not it, there had also been an increase in satisfaction of safety for caring for patients which was expressed by the nurses (Marsh, 2016).

A mixed-method study revealed that emergency departments who implement organizational characteristics are very likely to reduce overcrowding. The mixed-method study was focused on twelve separate hospitals consisting of four high-performing, four high-performing improving, and four low-performing hospitals. The selection of hospitals for this study came from the 2012 Centers for Medicare & Medicaid Services top and bottom 5% recruited and were chosen by the highest improvement in performance between 2012 – 2013. Throughout the twelve hospitals chosen, overcrowding of emergency departments was a known hospital wide problem. It is noted that addressing overcrowding of emergency departments between all twelve hospitals varied largely. Though each hospital had their own strategies on how to decrease overcrowding, organizational characteristics within some of the hospitals had shown the biggest impact on decreasing length of stay. There are four organizational domains that impacted the decrease in overcrowding; this includes; performance accountability, hospital wide coordinated strategies, executive leadership involvement, and data-driven management. The outcome of this study encourages other hospitals to incorporate some or all of the

organizational domains for successfully decreasing the chances of overcrowding because these domains represent actionable and identifiable changes toward overcrowding in emergency departments (Chang et al., 2018).

The Urgent Matters experience, according to the September 2004 report, "shows that hospitals can dramatically improve patient flow and decompress their emergency department (ED) without investing significant resources, but it takes commitment and several important ingredients." These include:

- Recognizing that ED crowding is a hospital-wide problem, not an ED problem.
- Building multidisciplinary, hospital-wide teams to oversee and implement change.
- Determining the presence of a "champion" to sell patient-flow improvement to medical staff and executive management.
- Guaranteeing management's support.
- Using formal improvement methods, such as Rapid Cycle Change, to improve patient flow.
- Committing to rigorous metrics.
- Sharing outcomes and results with all involved staff.
- Finding the right balance between collaboration and competition.

Note: Adapted from "Improving Patient Flow and Overcrowding in Emergency Departments", by Anne E. Stein (2005) *JONA: The Journal of Nursing Administration, 35*(6). doi:10.1097/00005110-20050600000001

A study which used a university teaching hospital I Switzerland as an example for exploring possible improvements for patient care by using dynamic simulation tools. The goal of this study was to solve complex issues within the hospitals. A quick look at how many more non-urgent emergency department visits happen versus how many urgent emergency department

visits occur is baffling. Take a look at the chart below demonstrating the hospital used in this study for which was adapted from the study article (Exadaktylos, 2008).

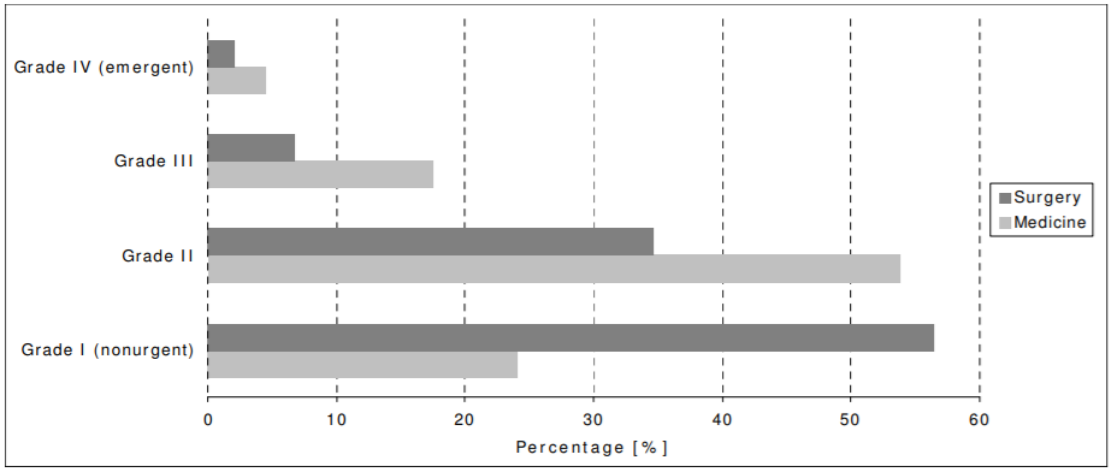

Figure 1
Distribution of acuity from grade I (non-urgent) to grade IV (emergent) in the surgical and medical tracks.

Note: Adapted from Exadaktylos, A. K., Evangelopoulos, D. S., Wullschleger, M., Bürki, L., & Zimmermann, H. (2008). Strategic emergency department design: An approach to capacity planning in healthcare provision in overcrowded emergency rooms. *Journal of Trauma Management & Outcomes, 2*(1). doi:10.1186/1752-2897-2-11

The goals developed within the study while creating a DS model with a specific software (Ithink software) there were 5 important steps to be followed carefully. One, to give the objectives and goals of the simulation. This could be information that management can use to make appropriate medical decisions. Second, give in detail the current system and what the development of the model is. For example; this model in this study was developed to give directions on patient flow. Third, collect data. To complete the study in an accurately manner there will need to be very defined core data from within the emergency department. Fourth, Test the model out. Give the process owners some thing to give them a little more insight on how the

changes will affect things. Fifth, provide system solutions, analysis, and thinking-scenarios. There will need to be given solutions and ideas for alternative approaches since the simulation cannont fully make any real changes to the current process that has been put into place (Exadaktylos, 2008).

Results from the study concluded that the simulation shows an impressing high growth that continues in the emergency departments patient flow. The 2002 simulation showed that lack of available beds happens sometimes. This is including the 30,000 patients; 44% medicine/56% surgery. As for the 2008 scenario it was shown that there were lack of beds in three comparative simulations that were increasing. This is including the 35,000 patients; 47% medicine/53% surgery. Reputation is key to your hospital. More than many of hospital patients make their first impressions based on the emergency department. The reason for this is because 30% - 40% of patients are admitted to the hospital through the emergency department first. When the emergency departments patient volume continues to grow over its capacity it can damage that emergency departments image. The outcome of the study shows in detail on the table (figure 5) below for which has been adapted by the study article (Exadaktylos, 2008).

Journal of Trauma Management & Outcomes 2008, **2**:11 http://www.traumamanagement.org/content/2/1/11

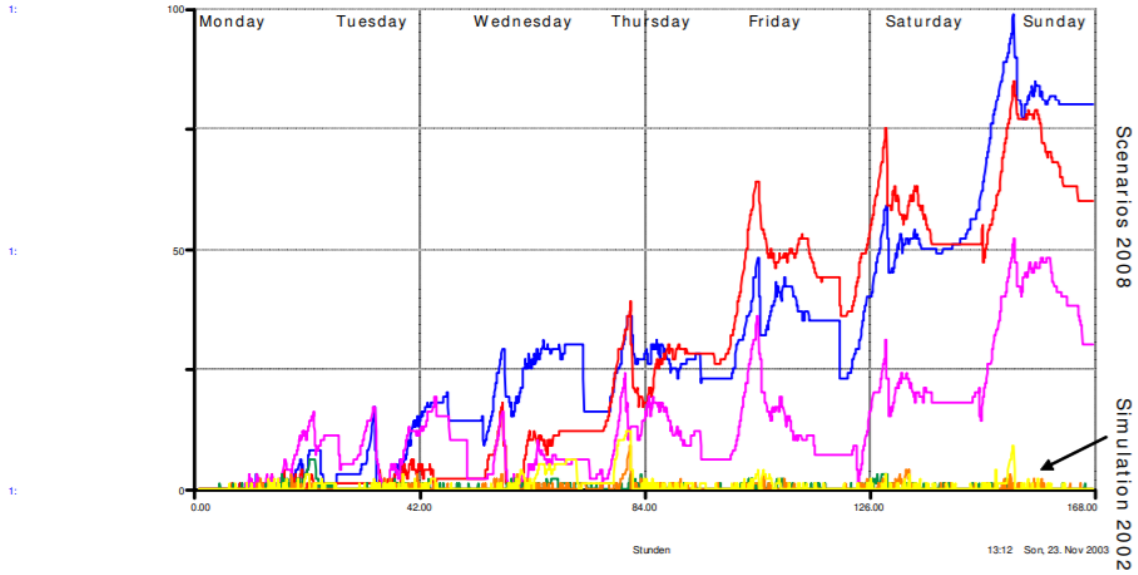

Figure 5
The graph represents the number of *beds lacking* at a given capacity (BS) during one week for different scenarios; it shows a 2002 simulation (yellow, orange, green) and 3 comparative scenarios in 2008 (blue, red, pink). The scenarios were varied according to adjustable variables such as patient volume, patient mix (i.e. acuity, surgery vs. medicine), arrival time distribution, and average length of stay.

Note: Adapted from Exadaktylos, A. K., Evangelopoulos, D. S., Wullschleger, M., Bürki, L., & Zimmermann, H. (2008). Strategic emergency department design: An approach to capacity planning in healthcare provision in overcrowded emergency rooms. *Journal of Trauma Management & Outcomes, 2*(1). doi:10.1186/1752-2897-2-11

Beginning January 1, 2014, the Joint Commission created standards to be followed with recommendations to not exceed 4hours. The original standards were to help address patient flow, behavioral health emergencies, hospitals, and boarding, but in 2014, The Joint Commissioner added new standards to measure goals and set goals to mitigate patients boarding that come into the emergency department (Somma et al., 2014).

Full capacity protocol (FCP) is another organizational procedure that has positive results from staff, LOS reduction, faster patient placement in rooms, improvements in staff and patient satisfaction within emergency departments who utilize this protocol. The FCP works in addressing the issue that blocks the flow of admitting patients. Some of the key points in in the FCP are to be able to determine when the emergency department has reached its full capacity, know the process for implementing the transfer, guidelines for discontinuing the practice, and patients eligible for hallway beds. It is also recommended that hospitals should begin with decreasing admissions in the hospital from the emergency department (Somma et al., 2014).

In a study that contained charts of patients who were held in the emergency department for over 24 hours within the hospital, Inman Hossein Hospital; the proposed solutions from the study were to create a holding unit, have an active inter- facility transfer, and to govern the admitting of patients that need ICU care for relating wards. The study's outcome was positive in decreasing patients stay (Hosseininejad et al., 2014).

Based on a hypothesis-generated study by the Academic Emergency Medicine, 2011, that analyzed, observed, and identified how clinicians within the emergency department manage the work pressure in increasing patient flow within an environment that is characterized by emergency department crowding and delayed patient admissions; without any adverse consequences, the study tested system interventions of the dynamic models that replicate the work of emergency department clinicians. Of note, the study suggests that emergency clinicians, physicians, and nurses will benefit most by receiving more systematic training focused on the how care is organized, learning about external negotiations through a dynamic systems point of view, and how to communicate. Emergency department complexity should be dealt with by first, the whole hospital or the wider health system taking accountability for emergency department

patient flow. Efficiency measures within the emergency department alone are great but it is the efficacious measures that come from quality, financial, and organizational indicators that can deliver better measures of an emergency department's performance. To reduce work pressure and enhance patient flow relies on a practical intervention in understanding the problem at hand (Nugus et al., 2011).

Some results Collis concluded from the review for better improvements on decreasing emergency department overcrowding were to modify emergency department work practice and to communicate with patients. The communication between the staff and patients can improve the patient's outcome and experience if there were an allocated registered nurse and medical practitioner assigned to a group of about 5 patients. Possibly changing how information is displayed within the emergency department to ensure that staff can locate their patients at all times (Collis, 2010).

In a review article (Derlet & Richards, 2008), "Ten Solutions for Emergency Department Crowding", reviewed by Robert W. Derlet, MD (Derlet & Richards, 2008) and John R. Richards, MD (Derlet & Richards, 2008) they lay out ten examples that have been proven to be effective within solving emergency department crowding.

1. Expand Hospital Capacity

   The leading cause in overcrowding is undoubtedly from the boarding of inpatients within the emergency department. Expanding the capacity of hospitals would not only allow for more patients to be cared for, but would shorten patients' length of stay. With expansion of hospital beds, the staff will also grow.

2. Stop regulating hospitals to the extreme (Derlet & Richards, 2008).

In California, the legislative (Derlet & Richards, 2008) mandated hospitals to decrease flexibility in emergency department operations. This was a cause of a decrease of nurses based on a fixed patient: nurse ratio. With the mandated decrease in flexibility, this leaves patients to sometimes be placed in hallways without direct nursing observation or patients who are very ill remain in the waiting room when an emergency department is overcrowded. Believing that this rule should be more relaxed when applying to emergency departments, this would make more room for flexibility during times of overcrowding.

3. Provide care only to patients with emergencies (Derlet & Richards, 2008).

   Since emergency departments cannot deny care to a patient it has been hard to identify if the patient is actually in urgent need of care. There are ways around identifying whether or not a patient is in need of non-urgent or urgent care by a triage nurse who completes a medical screening exam (MSE) to determine if the patient is in need of emergency care or needing to be referred to an urgent care clinic instead.

4. Provide alternatives for primary care of the uninsured (Derlet & Richards, 2008).

   Due to the many county health departments not having adequate facilities for ambulatory clinics for the uninsured patients, emergency departments are often used by the uninsured patients as their primary care destination regardless of whether or not it is urgent or non-urgent. Providing clinics that are appropriate for those that are uninsured would open new doors for uninsured patients to be seen rather than visiting the emergency department for non-urgent treatments.

5. Stop boarding admitted patients in the Emergency Department (Derlet & Richards, 2008).

   While there is overcrowding, boarding admitted patients in the emergency department hallways is not the best option as this can result in emergency department congestion and poor outcomes. The better proposed option during a time of overcrowding would be to board patients in the inpatient hallways instead of in the emergency department hallways. The benefit from this will be quicker access for the staff to accommodate patients with getting an inpatient room as soon as one becomes available.

6. Use evidence-based guidelines to address imaging over utilization (Derlet & Richards, 2008).

   During just one shift, CT scans in an emergency department are ordered on 50% of all patients within that same period. Emergency department staff ordering CT scans or MRI's take up a lot of time to be completed and increases wait time. With many CT scans being ordered it raises much concern as it has been estimated that for every 1,000 CT scans performed on children, one cancer death occurs. The best way to avoid introduction to exposure of radiation to patients would be to only order CT scans confidently based on evidence or utilize an ultrasound if needed.

7. Change admitting patterns

   To help decrease the demand for intensive care unit beds within a hospital could be done by implementing helpful measures by adapting some criteria that standardizes telemetry and intensive care unit admissions. At the patient's initial

onset of what patient presented with to the emergency department which resulted in intensive care unit admission might actually need a lower level of care after stabilization and treatment.

8. Expand the role of ancillary ED staff and hallway care (Derlet & Richards, 2008).

   Hallway evaluations within emergency departments lack privacy and space (Derlet & Richards, 2008). They also have the potential (Derlet & Richards, 2008) to created poor outcomes (Derlet & Richards, 2008), but without making use of the hallways it would created much longer wait times. Because this method is used in emergency departments daily, it would make better sense to expand the emergency department staff to better observe those in hallways needing care.

9. Call the nurse first

   Many hospitals now have developed (Derlet & Richards, 2008) a nurse assistance phone (Derlet & Richards, 2008) service to help triage patients to (Derlet & Richards, 2008) a clinic or (Derlet & Richards, 2008) to the emergency department based on symptoms and information given. This has been proven to prevent more emergency department visits that may have been unnecessary. Although nurse assistance phone services are helpful in cutting unnecessary health care costs, it is also an expensive service for the hospital to provide; however, the amount of health care costs from emergency visits prevented outweighs the cost of the nurse assistance phone service.

10. Prevent disease and injury

    Encourage patients to get a primary care provider and to keep visits regular. Visiting your primary care provider regularly could help mitigate the number of

patients presenting to the (Derlet & Richards, 2008) emergency department with uncontrolled (Derlet & Richards, 2008) obesity, hyperlipidemia, hypertension, and (Derlet & Richards, 2008) diabetes (Derlet & Richards, 2008).

A few recommendations for pediatric medical staff to solve emergency department overcrowding; to help parents make better informed decisions on responding to acute medical problems by educating them on the appropriate usage of calling 911, the emergency department, and how to reach the regional poison control center before there is an emergency that occurs, make every patients emergency department experience one that is educational for the family and patient by working together with the emergency care professionals, inform patients of after hour clinical services in utilization of getting care for acute problems rather than going into the emergency department, be sure to coordinate follow-up care after emergency department visits to fully be effective to the patient, consider being an advocate for improving reimbursement for Medicaid, encourage families to enroll in the SCHIP program for low-income families, know the constraints of local EMS services and hospital emergency departments and familiarize them, become an advocate for research focused on emergency department overcrowding or conduct one, and lastly, to consider advocating for the effective reforms that are in the current health care delivery system (Pediatrics, 2004).

Conclusion

In summary, emergency department crowding has become a national crisis needing areas of improvement due to the increase of medical errors, unsatisfied patient care, chaotic work environments and etc. Pin pointing the different reasons, causes, and areas of emergency

department overcrowding has helped identify corrective measures in improvement. Identifying the cause of the issue has introduced a number of different solutions in decreasing and avoiding emergency department overcrowding with most all solutions being implemented with an organizational structure to be followed.

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